

REMARKS

Careful consideration has been given by the applicants to the Examiner's comments and rejection of the application and claims, as set forth in the outstanding Office Action, and favorable reconsideration and allowance of the application, as amended, is earnestly solicited.

Applicants note the Examiner's objections to the specification in that the required section headings or titles are lacking, and appropriate amendatory action has been taken to obviate this particular ground of objection.

Furthermore, applicants note with regard to the claims, the Examiner's objections in that the previous or currently pending claims have been misnumbered and should be referred to as Claims 10-18 rather than 11-19. Accordingly, the application has been examined on the basis of renumbered Claims 10-18, as detailed in the Office Action.

Concerning the foregoing, applicants note the rejection of Claims 10 and 12-18 under 35 U.S.C. §102(b) as being allegedly anticipated by Becker, U.S. Patent No. 3,947,156, as extensively detailed in the Office Action.

Furthermore, Claim 11 has been rejected under 35 U.S.C. §103(a) as being allegedly unpatentable over Becker, U.S. Patent No. 3,947,156, in view of Becker, et al., U.S. Patent No. 5,275,541, as also detailed in the Office Action.

Finally, the Examiner has also referred to Bolt, U.S. Patent No. 5,785,508, as teaching a membrane pump possessing a similar structure to the one being claimed in this application.

Accordingly, in order to clearly and unambiguously present patentable subject matter in the claims, applicants have cancelled Claims 10-18, without prejudice or disclaimer, and herewith present new and more specific Claims 19-26, which are deemed

to define the invention in unambiguous and precise structural and functional terminology, while concurrently defining allowable subject matter in view of the art, irrespective as to whether the latter is considered singly or in combination.

Prior to reverting to the art cited by the Examiner, applicants submit that the present invention is essentially directed to the following:

Pursuant to the present invention, there is provided a membrane pump having a membrane which is actuated by a crank drive, which membrane bounds, together with a concave pump body surface, a pump chamber, an inlet channel and an outlet channel which open to respectively, an inlet opening and outlet opening formed in the pump body surface. The membrane includes a membrane core and an elastically deformable membrane ring with the membrane core having a convex surface adapted to the pump body surface. Hereby the inlet opening is located in a region of the pump body surface which the membrane initially approaches during an expulsion stroke of the crank drive, and wherein the elastically deformable membrane ring closes the inlet opening before reaching of top dead center by the crank drive. An inlet valve is also provided, which is arranged in the region of the inlet opening of the inlet channel, and in the edge region of the inlet opening, a surrounding control edge is formed against which the elastically deformable membrane ring bears so as to close the inlet valve.

The foregoing aspects are in no manner described in the prior art, concerning with applicants submit the following in traverse thereof:

Becker, U.S. Patent No. 3,947,156, discloses a diaphragm pump, especially a vacuum pump, in which a diaphragm of electrometric material is clamped at its outer peripheral portion against a peripheral portion of a rigid wall. This wall includes radially inwardly of the clamped portion, a concavely curved spherical surface forming in

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conjunction with the diaphragm, a pumping chamber with which there communicate inlet and outlet ports, and which are each provided with a non-return or one-way valve. A central, substantially rigid portion of the diaphragm is displaced between a suction stroke increasing the volume of the pumping chamber and a compression stroke. The wall surface and diaphragm are constructed and arranged in predetermined relationship relative to each other.

Becker discloses, in contrast with the present invention, an inlet opening and an outlet opening which extend directly into the pumping chamber, and whereby neither the inlet opening nor the outlet opening include a control edge formed in a region where the openings extend into the pumping chamber. Furthermore, the valves in Becker are positioned distant from the region where the inlet and outlet opening extend into the pumping chamber, and are therefore not closed by the deformable diaphragm (referring to Figures 1 to 3).

Even combining Becker, U.S. Patent No. 3,947,156, with Becker, et al., U.S. Patent No. 5,275,541, would not lead to the present invention, concerning the latter of which applicants submit the following comments:

Becker, et al., U.S. Patent No. 5,275,541, pertains to a diaphragm pump having a first fluid-operated valve which opens when the diaphragm performs a suction stroke, and a second fluid-operated valve which opens when the diaphragms performs a compression stroke. Hereby, the central portion possesses the shape of a resilient disc-shaped valving element, whose edge portion bears against a seat upon the valve being closed.

Accordingly, the inlet and outlet channels extend directly into the pumping chamber without having an edge surrounding the region where the channels reach into the

valves
indirectly
controlled
by diaphragm

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chamber as in the present invention. Moreover, the valves are positioned directly from the pumping chamber in the channels and are not closed by the diaphragm.

Basically, as indicated hereinabove, the combination of the Becker and Becker, et al. publications would not be applicable to the newly presented claims.

Reverting to Bolt, U.S. Patent No. 5,785,508, which was cited as being of close interest, applicants submit the following arguments in traverse thereof:

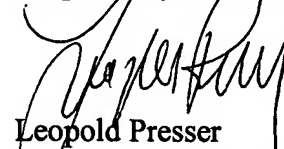
Bolt, U.S. Patent No. 5,785,508, provides diaphragm pump flap valves located in a pump head, which have a valve disk in which there are situated valve flaps circumscribed by partial ring-shaped recesses. These are respectively, flexibly connected with the remaining valve disk by means of a web, and with the valve disk being clamped between pump head elements in a region circumscribing each respective valve. An opening of the valve disk is located in a connecting area between the valve flap, web and outer clamping structure facing away from the valve flap. Hereby, in the pump head there are formed recesses surrounding the valves, into which the valve flaps can retract during valve opening operation (referring to Column 3, lines 48 to 50). In contrast with the present invention, Bolt teaches that the valves are pressed into these recesses during the opening operation and not during the closing operation, as is the case in the present invention. Furthermore, the recesses are not located in the region where the inlet and outlet openings extend into the pumping chamber (referring to Figure 1), and the valves are therefore not closed or pressed into the recesses by the diaphragm but rather by the pressure of the pumped fluid or gas.

In summation, pursuant to the present invention by providing a control edge surrounding which is formed in the edge region of the inlet opening against which the elastically deformable membrane ring bears so as to close the inlet valve, the inlet valve

together with the valve plate is securely closed on all sides during an expulsion stroke. Since the inlet valve is directly closed by means of the membrane in the instance of an expulsion stroke, the undesired dead space during ^{tank?} (tan) expulsion stroke is reduced and therewith there is increased the efficiency and reliability of the pump. To the contrary, none of the prior art references disclose an edge formed in the region where the inlet or outlet openings extend into the pumping chamber. Moreover, since in all the references the valves are placed in the inlet and outlet channels distant from the region where the openings reach into the pumping chamber, the valve is not closed by the diaphragm.

On the basis of the foregoing, and the submission of new Claims 19-26, applicants respectfully submit that the application is deemed to be in clear condition for allowance, and the early issuance of the Notice of Allowance is earnestly solicited. However, in the event that the Examiner has any queries concerning the instantly submitted Amendment, applicants' attorney respectfully requests that he be accorded the courtesy of possibly a telephone conference to discuss any matters in need of attention.

Respectfully submitted,



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